

Claims

- [c1] A method of electromanipulation for effecting substantially simultaneous electroporation and electromigration of molecules into cells by applying to a cellular target a preselected electrical waveform.
- [c2] The method of claim 1 wherein the preselected electrical waveform comprises at least one curved component.
- [c3] The method of claim 2 wherein the at least one curved component has a duration no greater than five minutes and a maximum amplitude no greater than 10,000 V/cm.
- [c4] The method of claim 2 wherein the at least one curved component increases in amplitude as a function of time.
- [c5] The method of claim 2 wherein the at least one curved component decreases in amplitude as a function of time.
- [c6] The method of claim 1 wherein the preselected electrical waveform further comprises increasing and decreasing curved components.
- [c7] The method of claim 6 wherein the preselected electrical waveform further comprises a substantially constant amplitude component interposed between the increasing and decreasing curved components.
- [c8] The method of claim 2 wherein the preselected electrical waveform further comprises a substantially constant amplitude component.
- [c9] The method of claim 8 wherein the substantially constant amplitude component is applied prior to the at least one curved component.
- [c10] The method of claim 8 wherein the substantially constant amplitude component is applied subsequent to the at least one curved component.
- [c11] The method of claim 1 wherein the preselected electrical waveform comprises at least one linear component.
- [c12] The method of claim 11 wherein the at least one linear component has a

duration no greater than five minutes and a maximum amplitude no greater than 10,000 V/cm.

[c13] The method of claim 11 wherein the at least one linear component increases in amplitude as a function of time.

[c14] The method of claim 11 wherein the at least one linear component decreases in amplitude as a function of time.

[c15] The method of claim 11 wherein the preselected electrical waveform further comprises increasing and decreasing linear components.

[c16] The method of claim 15 wherein the preselected electrical waveform further comprises a substantially constant amplitude component interposed between the increasing and decreasing linear components.

[c17] The method of claim 11 wherein the preselected electrical waveform further comprises a substantially constant amplitude component.

[c18] The method of claim 17 wherein the substantially constant amplitude component is applied prior to the at least one linear component.

[c19] The method of claim 17 wherein the substantially constant amplitude component is applied subsequent to the at least one linear component.

[c20] The method of claim 1 wherein the preselected electrical waveform comprises a plurality of coincident, substantially rectangular components whereby the latest time that the following rectangular component can begin is substantially simultaneously with the completion of the preceding rectangular component.

[c21] The method of claim 20 wherein the plurality of coincident, substantially rectangular components are of differing amplitudes.

[c22] The method of claim 20 wherein the plurality of coincident, substantially rectangular components have durations no greater than five minutes and maximum amplitudes no greater than 10,000 V/cm.

[c23] The method of claim 1 wherein the preselected electrical waveform has an

amplitude less than 0.

[c24] The method of claim 1 wherein the preselected electrical waveform is administered in series.

[c25] The method of claim 24 wherein at least two preselected electrical waveforms in the pulse are of differing shape.